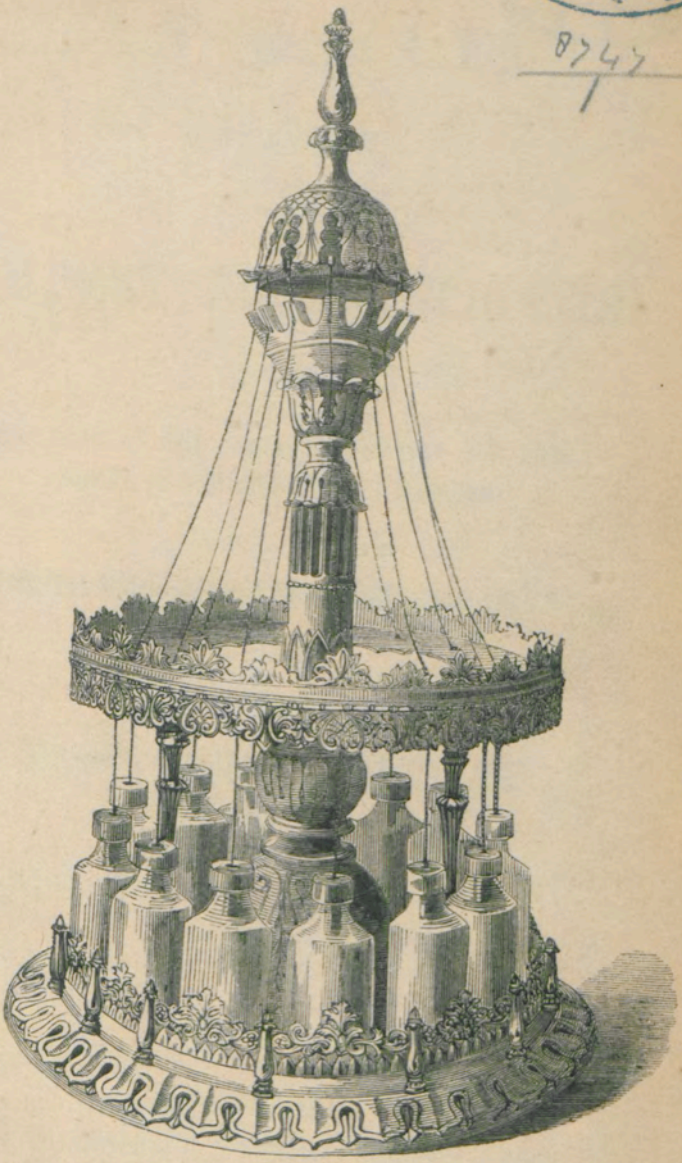
Pamphlets Vol 68
METEOROLOGICAL OFFICE
8747



TEMPEST PROGNOSTICATOR.

METEOROLOGICAL OFFICE

# AN ESSAY

## EXPLANATORY

OF THE

# TEMPEST PROGNOSTICATOR

IN THE

## BUILDING OF THE GREAT EXHIBITION FOR THE WORKS OF INDUSTRY OF ALL NATIONS.

READ BEFORE THE WHITBY PHILOSOPHICAL SOCIETY, FEBRUARY 27TH, 1851.

BY

GEORGE MERRYWEATHER, M.D.,

WHITBY,

THE DESIGNER AND INVENTOR.

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LONDON:

JOHN CHURCHILL, PRINCES STREET, SOHO.

S. REED, WHITBY, AND ALL BOOKSELLERS.

MDCCCLI.

# INTRODUCTION.

WHOEVER has entertained any doubt as to the policy of the Great Exhibition of all Nations, about to take place in London, ought to know, and bear in mind, the sentiments expressed in the following statement, made by the illustrious Humboldt,—the living patriarch of science, in the introduction to his Cosmos, translated by Otté.

"An equal appreciation of all branches of the mathematical, "physical, and natural sciences, is a special requirement of the pre- "sent age, in which the material wealth and the growing prosperity "of nations are principally based upon a more enlightened employ- "ment of the products and forces of nature. The most superficial "glance at the present condition of Europe, shows that a diminution, "or even a total annihilation of national prosperity, must be the "award of those states who shrink with slothful indifference from the "great struggle of rival nations in the career of the industrial arts. "It is with nations as with nature, which, according to the happy "expression of Göthe, 'knows no pause in progress and develop- "ment, and attaches her curse on all inaction.' The propagation "of an earnest and sound knowledge of science can therefore alone "avert the dangers of which I have spoken. Man cannot act upon "nature or appropriate her forces to his own use, without com- "prehending their full extent, and having an intimate acquaintance "with the laws of the physical world. Bacon has said that, 'in "human societies, knowledge is power.' Both must rise and sink "together. But the knowledge that results from the free action of

"thought, is at once the delight and the indestructible prerogative of "man; and in forming part of the wealth of mankind, it not un- "frequently serves as a substitute for the natural riches, which are "but sparingly scattered over the earth. Those states which take "no active part in the general industrial movement, in the choice "and preparation of natural substances, or in the application of "mechanics and chemistry, and among whom this activity is not "appreciated by all classes of society, will infallibly see their pros- "perity diminish in proportion as neighbouring countries become "strengthened and invigorated under the genial influence of arts and "sciences."

For my part, I consider the Great Exhibition of all Nations, to be one of the grandest ideas that ever emanated from the mind of man. As to its beneficial results, I never harboured a doubt: therefore as a provincial individual, I have studied to do my best, to contribute my humble mite towards its advancement; and I trust the discovery of the "Tempest Prognosticator" will be considered no unworthy addition to the talent and ingenuity of my own country.

As my discovery is of a prophetic nature, I may be permitted to venture a prediction, in asserting, that Paxton's Crystal Palace will stand longer, and more firmly rooted than the elm trees it encloses;—that it will long remain a splendid monument of British grandeur and prosperity;—and will be regarded by the Public of future ages as a Temple of Fame, where the lowly artisan will always possess the power of exhibiting the products of his silent, but industrious efforts, without having the care-worn reflection, that he will be crushed and ruined in the attempt. Experience teaches, that some of the finest discoveries, and those of the greatest utility, have originated from the happy thoughts and researches of retired and unobtrusive individuals. The number of important scientific ideas that have been lost to the world, from the inability of the parties bringing them into notice, must have been very considerable: hence the incalculable value of periodic Great Exhibitions, for stimulating latent energies and talent in every province of the British Empire.



It is not 230 years since the celebrated Galileo made the discovery of the principle of the Barometer, so admirably carried out by Torricelli and Pascal; for which and other discoveries, he was summoned before a congregation of cardinals and monks, and sent before the tribunal of the Holy Inquisition, which compelled him to recant his "sinful and detestable errors and heresies," and sentenced him to the dungeons of the Inquisition for life. What would have been my fate, had I brought out my discovery of the Tempest Prognosticator at that time, and in that country? In this great country of freedom and liberty, no such tribunal has been allowed to exist: but in lieu of which, we have for all poor Discoverers and Inventors an unholy Inquisition in the form of Patent Laws, which obliges the poor artisan to involve himself to the amount of several hundred pounds, with the apparent object of securing to himself and family the benefits of his own toil and ingenuity! If the Patent Laws are not a disgrace to the age, they are, certainly, a curse to the ingenuity of the poor Inventor.

I hailed with delight the scheme lately issued by the Royal Society of Arts for the amendment of the Patent Laws, which if carried into effect, would, I am sure, be most satisfactory to all poor Inventors, for whom I feel the keenest sympathy. As it was through the influence of a Prince of Tuscany, that the venerable Galileo was rescued from his dreadful fate, so it will be a solace to all poor artisans to reflect, that, the President of the Royal Society of Arts, is the Prince Consort of our beloved Queen.

(COPY OF THE NOTICE.)

TO THE ROYAL COMMISSIONERS OF THE GREAT EXHIBITION OF ALL NATIONS, 1851.

*Whitby, September 26th,* 1850.

My Lords and Gentlemen,

I shall feel much obliged if you would provide standing room in the Building for the Great Exhibition of next year, for a circular, pyramidal apparatus of 3 feet in diameter and 3 feet 6 inches in height: composed of French polished mahogany, glass, silver, brass, &c.; to illustrate my discovery of the means of anticipating storms: to be designated the "Tempest Prognosticator;" which I am desirous of promulgating for the first time, on that occasion, for the benefit of all Nations.

As it is my intention to simplify this apparatus as much as possible, to render its operations comprehensible to every one, and manageable by all who take pleasure in meteorological pursuits; I wish to ask the following question. Will the Registration of this new and singular discovery, protect it from piracy, as long as it is in the Great Exhibition?

There will be a pamphlet published at the commencement of the opening of the Great Exhibition, giving the whole history of the discovery, containing vouchers of its efficacy, and instructions for its management and appliance: and my belief is, that it will be the perpetual means of saving thousands of lives, as well as protecting an immense amount of property. I therefore hope, it will be deemed worthy of a prominent, and easily accessible place in the Great Exhibition.

I have the honour to be,
My Lords and Gentlemen,
Your most obedient Servant,
GEORGE MERRYWEATHER, M.D.

# CHAPTER 1.

In all philosophical disquisitions, it is of the most essential importance, that no attempt should be made in advancing anything as new, or as a previously unknown fact, until a most searching examination has been entered into. In fairness to myself, and in justice to the subject of the present Essay, which is of a meteorological nature; I must avail myself of the knowledge of the most celebrated authors, whose writings I shall have to make use of as my Text-Books. The question I shall now have to ask is. What do we at present, know of Meteorology? I will leave this to be answered by Baron von Humboldt, whose universal scientific knowledge, and whose writings are the admiration of the world. This great practical philosopher's answer is. "The meteorological portion of the "descriptive history of nature which we are now con- "cluding, shows, that the processes of the absorption "of light, the liberation of heat, and the variations of "the elastic and the electric tension, and in the hygro- "metric condition of the vast ærial ocean, are all so

"intimately connected together, that each individual "meteorological process is modified by the action of all "the others. The complicated nature of these disturb- "ing causes, increases the difficulty of giving a full "explanation of those involved meteorological phenome- "na; and likewise predetermination of atmospheric "changes, which would be so important to horticulture, "agriculture, and navigation, no less than for the com- "fort and enjoyment of life. Those who place the "value of meteorology in this problematic species of "prediction rather than in the knowledge of the phe- "nomena themselves, are firmly convinced that this "branch of science, on account of which so many "expeditions to distant mountainous regions have been "undertaken, has not made any very considerable pro- "gress for centuries past. The confidence which they "refuse to the physicist, they yield to changes of the "moon, and to certain days marked in the calendar by "the superstition of a by-gone age."*

"If however in the present age, which is so strongly "characterised by a brilliant course of scientific dis- "coveries, we perceive a want of connection in the "phenomena of certain sciences, we may anticipate the "revelation of new facts, whose importance will probably "be commensurate with the attention directed to these "branches of study. Expectations of this nature may "be entertained with regard to meteorology, several "parts of optics, and to radiating heat, and electro- "magnetism, since the admirable discoveries of Melloni

* Cosmos, Vol. 1, p. 345.



"and Faraday. A fertile field is here opened for dis- "covery, although the voltaic pile has already taught "us the intimate connection existing between electric, "magnetic, and chemical phenomena."*

Thus it appears, there is an extensive meteorological expanse, still open for exploration. Notwithstanding the brilliant discoveries that have been made, during the half century just concluded, I have no doubt the next half century will be as prolific in discoveries as its predecessor.

On this "fertile field" I have at present, ventured to enter. In all scientific investigations, it will not do, in these enlightened days, for a man to assert, that he can do this, or he can do that, but he must prove that he has done what he professes; in this last position I wish to appear. In order to accomplish this end, it was necessary to devise a means, which I trust will prove satisfactory. I had to fix upon a person, to whom I might address my meteorological notices. No person appeared to me better calculated than a gentleman presiding over a philosophical institution; I therefore asked the President of the Whitby Philosophical Society, who is also President of the Mechanics' Institute, to permit me to address letters to him, on sheets of paper passed through the Post Office, intimating to him beforehand, the approach of any storm, that was likely to take place. To this request he very politely acceded. I feel myself fortunate, in having been so situated, that I could possess the advantage of making communica-

* Cosmos, Vol. 1, p. 29.

tions to a Gentleman of such high character and respectability;—a man who is beloved and esteemed in the district in which he resides, and who is ever ready to be the foremost in promoting any good work. I feel myself doubly fortunate, because Mr. Belcher's scientific tastes, are so much in unison with my own.

I beg in this place, to express my obligations to the Gentlemen of the Committee of Management of "Lloyd's" for the handsome manner in which I have been treated by them, and for giving publicity to a number of my Experiments.

I have had many advantages, as to position, for my observations. The magnificient Piers of Whitby, have enabled me, to walk out to sea daily:—from the East Cliff, which is about 200 feet above the level of the sea, (that washes at its foot,) I have had the most extensive view: in two hours, I could be upon an elevation, west of Whitby, of about a 1000 feet high, from which I could command the most splendid panoramic view. I must, therefore, confess, that I have been truly aided by nature in this undertaking, which will appear more so, before the conclusion of this Essay.

I now proceed to give a copy of my Vouchers, which have never been seen by me, since they were written, neither has a single Voucher been suppressed. From previous observations and experiments, I felt myself secure, before I entered upon such a bold undertaking. I felt certain, that I should not "with a flash begin and end in smoke."



*Copies of* VOUCHERS *addressed to Henry Belcher, Esq., President of the Whitby Philosophical Society, and the Whitby Institute.*

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No. 1. Whitby, January 9th, 1850.

I have, for a length of time, had it in contemplation to write a Paper on the Prognostication of Storms: as the subject is one of great importance, not only as affording the means of causing the salvation of life, but the protection of property; I trust you will co-operate with me to the extent I may require. I address you, at present, as the President of the Whitby Philosophical Society and the Whitby Institute, before which Institutions, I hope to have the honour of bringing forward the subject and explaining its objects.

As the foreknowledge of Storms must be of universal importance, I wish to support myself upon unquestionable data: I, therefore propose addressing you, from time to time, through the medium of the Post Office, (in order that my notices may be duly stamped with the date,) informing you beforehand of an approaching commotion in the atmosphere. On these letters, I should feel obliged, if you would write your notes, as to the correctness, or inaccuracy of my prognostications.

George Merryweather, M.D.

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No. 2. Whitby, January 15th, 1850.

I shall feel obliged if you would ask Mr. Frank Langborne to state to you, what I said to him, his mother and Mr. Joseph Campion, jun., on Sunday evening last, about six o'clock, concerning the present storm. Perhaps, you will be kind enough to note down his evidence on this sheet of paper, as I shall hereafter have occasion to refer to it.

George Merryweather, M.D.

No. 3. Whitby, January 27th, 1850. 9 a.m.

Since eight o'clock yesterday evening, I find that by my observations, which commenced at that time, that a storm may be expected in the next forty-eight hours. I almost feel sorry to predict such a thing, this splendid, bright, calm, frosty morning.

George Merryweather, M.D.

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No. 4. Whitby, February 2nd.
Saturday, 5 p.m.

I beg to draw your particular attention to the published accounts of the disastrous effects of the last storm on the 29th ultimo, I wrote to you about on the 27th ultimo.

I have now to inform you that, I have reason, from my observations this day, to predict another storm, to take place within thirty-six hours.

I do not trouble you with a little blustering of the wind, such as took place last night.

George Merryweather, M.D.

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No. 5. Whitby, February 11th, 1850.
Monday, 2 p.m.

My last notice to you of a coming Storm was on Saturday the 2nd instant, which, with intermissions, continued for nearly a week. The great loss of life and devastation it has caused, are fully narrated in the daily and weekly papers.

At Two o'clock on Saturday afternoon last, I had distinct indications of another storm, which I did not write to you about, as the morning of that day was so gusty. Although yesterday was such a brilliant day, the storm commenced from the south this forenoon.

The object of the present note is to draw your attention to Saturday's "Times," p. 8, also to the "Yorkshire Gazette."

George Merryweather, M.D.



No. 6. Whitby, February 17th, 1850.
Sunday, 8 p.m.

On Friday evening I had intimation of the wind that has taken place this day; but this evening I have strong indications of an approaching Storm, which I suspect will be accompanied with lightning either, here, or in other parts.

George Merryweather, M.D.

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No. 7. Whitby, February 25th, 1850.
Monday Morning.

I last addressed you on Sunday, 8 p.m., the 17th inst., advertising you of a Storm, which commenced on Wednesday night from N.W., aud continued during the following day. This experiment is interesting, as the intervening days of Monday, Tuesday, and Wednesday, were all spring-like.

I beg to call to your remembrance a conversation we had at the Institute, in the presence of Mr. Richard Craven, about a fortnight ago, when I observed to you that, I apprehended from the number of Storms we had had this year, that we should hear of Earthquakes, and Volcanoes in action in distant regions. I copy the following from the "Illustrated London News" of February 25th, 1850, p. 131. "A letter from Naples of the 9th, gives an account of an "eruption of Mount Vesuvius, which has just occurred. According "to this account it is the most magnificient ever seen."

George Merryweather, M.D.

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No. 8. Whitby, February 25th. 8 p.m.

Although I addressed you this morning, I feel at present, authorised to intimate to you the approach of a Storm; notwithstanding I do so on such a beautiful, serene, moonlight night.

George Merryweather, M.D.

No. 9. Whitby, March 23rd, 1850.
Saturday Afternoon.

My last letter to you was dated on Monday evening, 8 p.m., the 25th ultimo. On the Thursday afternoon following, the sea was of glassy smoothness, but the wind set in the same night, and although lulled during Friday, it stormed during the night, and also on Saturday night.

I beg to observe, that it is worthy of notice, that I have not troubled you for nearly a month, for which, I do not think you can find cause, to call me to account.

On Thursday night after the Committee Meeting, I had strong indications of an approaching Storm. As I found I should be too late to get a letter into the Post for you, stamped with that days' date; I made up my mind to satisfy you with the evidence of an individual, to whom I made the communication immediately, after I had made my observations. This Storm commenced last night, and is still raging.

In the "Illustrated London News" of March 16th, 1850, p. 170, you will find the following. "At Symrna two shocks of an Earth-"quake have recently been felt."

George Merryweather, M.D.

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No. 10. Whitby, March 30th, 1850.
Saturday Evening.

In consequence of the present storm, you will be surprised at not hearing from me. On Thursday at 5 p m., I had the best signals I have met with, indicating a Storm, but owing to my mind and attention being so much occupied with my professional engagements, I did not write to you. I trust, however, I shall hereafter, satisfy you, that no storm can escape me, without my possessing a previous knowledge of its approach.

George Merryweather, M.D.



No. 11. Whitby, April 3rd, 1850.
Wednesday, 10½ p.m.

I beg to prepare you for another Storm, which I have reason to suppose will take place in a short time.

George Merryweather, M.D.

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No. 12. Whitby, April 16th, 1850. 8 a.m.

On Wednesday the 3rd instant, 10½ p.m., I intimated to you an approaching Storm, which commenced from the N.W., on the Thursday night following, and wrecked a ship between the Piers.

At half-past ten o'clock last night, I had indications of a Gale or Storm. Although this morning is so mild and beautiful, I must do my duty.

George Merryweather, M.D.

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No. 13. Whitby, April 19th, 1850.
Friday, 11 p.m.

My last letter to you was dated 16th instant, advertising you of a Gale or Storm. To that letter I hope to give a satisfactory explanation. I have heard to day, that there was a thunder storm near to Stonegate this week.

I now beg to inform you that we are going to have some commotion in the air, perhaps, accompanied with lightning and thunder.

George Merryweather, M.D.

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No. 14. Whitby, April 24th, 1850.
Wednesday, 9½ p.m.

I wrote to you last Friday night, 11 p.m., the 19th instant, advertising you of an approaching commotion in the atmosphere, which commenced on Saturday night, and continued until yesterday morning from the north.

At one o'clock this afternoon, I had slight indications of another

commotion, which have so much increased, that I feel it my duty to inform you, that some storm is going to take place here, or in some other parts.

I lament, that I have to convey this news on such a beautiful, serene, moonlight night, with a rising Barometer.

George Merryweather, M.D.

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No. 15. Whitby, May 1st, 1850.
Wednesday, 8 p. m.

My last notice to you was dated the 24th ultimo, 9½ p.m. advertising you of an approaching commotion in the atmosphere, which turned out to be a smart, cold, S.E. gale on the following day,

When I met you in Baxtergate on Monday morning, I informed you, that I had had slight indications of another commotion the preceding evening, with increased signals on that morning. A north Storm commenced early this morning, which is dashing the waves over the Pier ends this evening.

In my letter of the 19th ultimo, I promised to give an explanation to my letter of the 16th, 8 a.m., in which I intimated an approaching gale or Storm. On the afternoon of Thursday, the 18th, the great storm took place at Dublin, 235 miles distant from this place, in a straight line. Also a thunder storm in the Isle of Man, on the following day; although nothing of moment took place here, there were thunder storms from 10 to 20 miles west of Whitby.

George Merryweather, M.D.

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No. 16. Whitby, May 2nd, 1850.
Thursday, 11 p.m.

Although I only addressed you a letter of explanation last night; I am obliged to inform you, that from my observations just taken, this fine, still, starlight night, there is going to be a commotion in the air, here or in some other parts.

If there be any thing, that I have regretted, it is in not communicating slight signals. On Wednesday morning the 10th ultimo,



I had similar indications to those just now observed—and the great storm took place in London, on Friday the 12th ultimo.

George Merryweather, M.D.

N.B. In referring to my note-book, I find that nimbi showers occurred during the day and night of Friday the 3rd of May, with N.W. breeze, which veered round to the N.N.E. the following morning.

As the summer is setting in, I find a kind of vacation to tempestuous weather. I therefore have had little occasion to trouble our worthy President. But that it may not be supposed, I was not on the alert, I must observe, that I had powerful signals of an approaching Storm on the 21st and 22nd, of May, when the wind was N. on the morning of the latter day, and S.W. in the evening. It was S.E. in the morning, and in the evening of the 23rd, N.E. On the morning of the 24th it was N.W. Although we had not any Storm at Whitby yet frightful thunder storms occurred on Thursday the 23rd, in various parts of the country, attended with loss of life, and great disasters; an account of which will be found in the "Illustrated London News" June 1st, 1850, p. 390.

I copy the following letter, written by a Gentleman of the highest honour and respectability, which I number among my Vouchers.

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No. 17. St. Hilda's Terrace, Whitby.
June 26th, 1850.

My dear Sir,

Your prophetic words "that you had signals on Monday morning (which you mentioned to me on the evening of that day) of an approaching change, with thunder, or a strong gale in the next 24 hours"—are verified! with the exception of about 12 hours (i.e.) the change has taken place within 36 hours, the Storm commencing I believe about 5 o'clock this morning.

Sincerely yours,

Thomas Watson.

No. 18. Whitby, July 20th, 1850. 1 p.m.

I have not addressed you on the subject of storms since the 2nd of May last. Indeed, I did not think to have renewed the subject until some time hence, but, this morning, I have such strong intimations of a commotion in the atmosphere that is about to take place, either here or in other parts, that I cannot resist advertising you of it, although it may not amount to a storm. I am sorry to interfere with your engagements this beautiful weather.

George Merryweather, M.D.

N.B. The result of this experiment was a strong S.E. breeze on the 22nd and 23rd of July.

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No. 19. Whitby, August 30th, 1850.
Friday, 8 a.m.

I have just time to inform you, that I had powerful signals last night, also this morning, of an approaching commotion in the atmosphere. The brilliancy of this morning, must not deter me from making this communication; neither the great height of the Barometer.

George Merryweather, M.D.

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No. 20 Whitby, September 26th, 1850.
Thursday, 9 p.m.

I last addressed you on Friday, the 30th ultimo, advertising you of an approaching commotion in the atmosphere, which did not commence until the Tuesday following, and continued more or less throughout the week.

When I saw you this morning, I informed you, that I had had signals of wind; but the signals have so much increased during the day, that I take advantage of this fine, still night to prepare you for an impending Gale or Storm.

George Merryweather, M.D.



No. 21. Whitby, September 30th, 1850.
Monday, 9 a.m.

When I had an interview with you at your Office on Saturday morning. In speaking of the wind I told you that "we had not done with it yet," as the veritable Storm has at length arrived. I shall feel obliged, if you would make a note on my last meteorological letter of the intimation I gave you on Saturday.

George Merryweather, M.D.

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No. 22. Whitby, October 4th, 1850.
Friday, 3 p.m.

My last notice to you of the weather was on Thursday night, the 26th ultimo, apprising you of an impending Gale or Storm; which commenced on the Saturday night following, and continued more or less, until the Tuesday following.

Although this is almost a perfectly calm day, I have had repeated signals since yesterday at noon, which have so much increased, that I must prepare you for a commotion in the atmosphere, which is about to take place, either here, or in other parts.

George Merryweather, M.D.

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No. 23. Whitby, October 14th, 1850.
Monday noon.

My last meteorological letter to you was dated on Friday, 3 p.m., the 4th instant, to prepare you for a commotion in the atmosphere, which commenced with a Storm on the Sunday evening following, at 7½ p.m., and continued with intermissions until last Friday night. For an account of the loss of life, and the destruction of property, occasioned thereby, I beg to refer you to the daily and weekly papers of the last week.

This last experiment is so exceedingly interesting, that I wish to draw your attention to the state of the Barometer, one of the most valuable instruments that science can boast of. But what an invalu-

able addition the Tempest Prognosticator must be, to foretell a Storm so long before the Barometer is materially affected. In this instance of what incalculable value this apparatus would have been, had it been distributed throughout the kingdom, to warn people, so long before-hand, of the dangers that were likely to take place from the winds; as much, or more so, as a householder to be told before-hand, that his house were threatened with fire. Precaution in both cases, would cause a sharp look-out, and in a great measure, dangers would be avoided.

When I met you on Saturday, I informed you, that we were going to have fine weather, which has proved so far to be the case, although the Barometer has been falling ever since. What could exceed this beautiful buoyant morning, bringing "health in the breeze?" Although Storms may do much harm, yet, they do much good in purifying the air.

Signals began on Thursday noon, October 3rd, 1850.
Notice given on Friday, October 4th, 3 p.m.
Vivid lightning in the east on Saturday, October 5th, from 3 to 4 a.m.
Thunder on Saturday afternoon.

| | | | | | *Bar.* | |
|---|---|---|---|---|---|---|
| Thursday, October 3rd, | | S.E. | 9 | A.M. | 29,91 | |
| | | S.W. | 10 | P.M. | 29,94 | |
| Friday " | 4th | S.W. | 9½ | A.M. | 29,93 | Very smooth sea. |
| | | S.W. | 10½ | P.M. | 29,82 | |
| Saturday " | 5th | S.W. | 9 | A.M. | 29,78 | |
| | | N.W. | 10 | P.M. | 29,75 | |
| Sunday " | 6th | S.W. | 9¼ | A.M. | 29,71 | Storm commenced 7½ p.m |
| | | | 10 | P.M. | 29,36 | |
| Monday " | 7th | N.W. | 9 | A.M. | 28,80 | |
| | | N.W. | 10 | P.M. | 29,01 | |
| Tuesday " | 8th | N.N.W. | 9 | A.M. | 29,34 | |
| | | N.W. | 10 | P.M. | 29,70 | |
| Wednesday | 9th | N.N.W. | 9 | A.M. | 29,90 | |
| | | N. | 11 | P.M. | 30,08 | |
| Thursday " | 10th | N.N.W. | 9½ | A.M. | 30,09 | |
| | | N.N.W. | 10 | P.M. | 29,98 | |



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|---|---|---|---|---|---|---|
| Friday, October 11th | | N.E. | 9¼ | A.M. | 30,09 | |
| | | N.E. | 10½ | P.M. | 30,39 | |
| Saturday " | 12th | N. | 9 | A.M. | 30,51 | |
| | | N.W. | 10 | P.M. | 30,48 | |
| Sunday " | 13th | N.W. | 10 | A.M. | 30,36 | |
| | | N.N.W. | 10 | P.M. | 30,21 | |
| Monday " | 14th | N.W. | 9 | A.M. | 29,98 | Brisk, buoyant breeze. |

N.B. The observations of the wind were taken from Whitby Lighthouse from 10 to 11 a.m., and 5 to 6 p.m.

George Merryweather, M. D.

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No. 24.

Whitby, October 23rd, 1850.
Wednesday, 11 p.m.

My last explanatory letter to you, was dated on Monday, the 14th instant, in which I intimated that we were going to have fine weather, which continued until Saturday night the 19th instant. On Sunday I had signals of a change about to take place, although I anticipated a rainy season, we had a blustering wind from the west last night, which has not continued during the day.

This has been a dark, dull, rainy day, but my signals have been so strong throughout the day, that I have reason to believe, we are going to have a Storm of an extensive kind. My Register Thermometer was 33° last night, and 30° the night before.

George Merryweather, M.D.

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No. 25.

Whitby, November 10th, 1850.
Sunday, 1 p.m.

My last notice to you of the weather was dated the 23rd ultimo, in which I intimated that there was going to be a Storm of an extensive kind; which began in the middle of that night, and continued more or less, until early of the Monday following. It was therefore, extensive as to time, but I heard of no serious damage done by it, except, it having again damaged the Breakwater at Dover. I beg to observe, that this last Storm was accompanied with much

rain, which I generally, find has a tendency to abate the violence of wind.

Although this is a beautiful day, I found signals registered, when I arose this morning, which have been so often repeated this forenoon, that I must encroach upon your "equanimity," and prepare you for another commotion in the atmosphere, about to take place here, or in some other localities.

George Merryweather, M.D.

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No. 26. Whitby, November 18th, 1850.
Monday, 4 p.m.

My last meteorological letter to you, was dated on Sunday, 1 p.m., the 10th instant, advertising you of an approaching Storm, which commenced at three o'clock on the Wednesday afternoon following, and continued until the next day. In this instance, you had legal notice, having had three days grace.

It is now my duty to prepare you for another Storm or Gale, which I find by my observations, is about to take place. Although it is comparatively mild and calm to day, I should not wonder, to see snow or hail accompanying it.

George Merryweather, M.D.

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No. 27. Whitby, November 23rd, 1850.
Saturday, 10½ p.m.

My last letter was dated on Monday last, the 18th instant, 4 p.m., intimating to you, an approaching Storm, which commenced the next day early, and continued throughout the following day, stranding the ship "George" at tbe foot of the battery.

At half-past nine this evening I had written down my observations, but an hour is not allowed to pass, before signals are at work. I must therefore prepare you for another commotion in the atmosphere although, it is such a clear, beautiful, moonlight night.

George Merryweather, M.D.



No. 28. Whitby, November 28th, 1850.
Thursday, 7 p.m.

I addressed you last Saturday night, the 23rd instant, apprising you of an approaching Storm, which commenced on Sunday morning, and continued more or less, until Tuesday, wrecking a ship off the East Cliff, and causing great disasters at sea, for an account of which, I beg to refer you to the daily papers.

The Storm I advised you of, on the 18th instant has been attended with the most disastrous and dreadful consequences, on the western coasts, as you will perceive by the "Daily News" of Monday last.

Although this is a fine, starlight night, and the Barometer high, and still rising; yet the Tempest Prognosticator is giving signals for another Storm, which is going to take place here or in other parts.

George Merryweather, M.D.

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The following is a copy of a letter to me, from the President of the Whitby Philosophical Society.

Mayfield, December 2nd, 1850. 9 a.m.

My dear Doctor,

On the 28th ultimo, you wrote to inform me that your Prognosticator was giving indications of another Storm "going to take place here or some other parts." Though my Barometer has fallen a little since the 28th, it is still standing at 2 10ths above 30, too high for stormy weather.

I should like to know whether your signals on the 28th have continued to the present time, and whether, as a general fact in the working of your machine, the signals of an approaching Storm are continuous until the Storm takes place, and has passed away.

I am, yours very truly,
H. Belcher.

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No. 29. Whitby, December 5th, 1850.
Thursday 9½ p.m.

My last letter was dated on Thursday last, the 28th ultimo.

I beg to acknowledge the receipt of you letter of the 2nd instant, to which I will shortly return an answer of explanation.

I have now to inform you, that my signals commenced at 7 o'clock last evening, and have been at work throughout this day; therefore, I must prepare you for a little turbulence in the atmosphere, which is going to take place here, or in some distant parts. At present it is a calm, starlight night, and a rising Barometer.

George Merryweather, M.D.

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No. 30. Whitby, December 17th, 1850.
Tuesday morning.

In my letter to you of the 5th instant, I promised to give you an explanation to your letter of the 2nd instant, which I cannot do better, than by sending you a copy of my meteorological notes; to which I beg your particular attention. The extraordinary lapse of time, that took place after my last notice, before the turbulence of the atmosphere occurred, I can only account for, from the steady density and weight of atmospheric pressure. While we were enjoying this delightful serenity, it appears from the "Daily News" that strong breezes were prevailing on the east coast of Ireland and at Southampton. I fully expected to hear of Meteors, but I heard of none, except one seen at Edinburgh on Friday night the 6th instant.

In returning from a professional visit beyond the Abbey on the afternoon of yesterday week; I beheld one of those splendid scenes that rarely occur at this season of the year. I had in the foreground the ruins of the venerable Abbey, "A beacon o'er the trackless deep," and the Church about 200 feet above the level of the sea, which reminded me of those beautiful lines

"Yon towering cliff, where proudly stand
A ruin'd Abbey's sculptur'd walls,
Points out to view, from sea or land,
The site of Streanshalh's ancient halls:

"The scenes where sainted Hilda prayed,
Where Cædman penn'd his heav'nly lays:
Where holy men their zeal display'd,
And sang their choral hymns of praise."—B.



On my right was a scene, which brought to my reccollection those graphic lines of Moore,

"The sea is like a silvery lake,
And o'er its calm the vessel glides,
Gently, as if it fear'd to wake
The slumber of the silent tides."

There was that calm stillness, that usually precedes a snow storm. Beyond was the variegated promontory of Sandsend, and the baronial woods and towers of Mulgrave, which contrasted well, over the splendid mansions of the West Cliff, with its verdant slopes. Over the town was a dense canopy of smoke, which seemed powerless to ascend. Over and beyond the smoke were the beautiful banks of the Esk, with the highlands in the distance. The whole of this scene was bathed in a pinky saffron vapour, and gave it a Claude Lorrain appearance. My admiration (begging our worthy member Mr. Stephenson's pardon) was soon checked, by the demoniacal panting of the steam engine, and its fiendish whistle; the steam from which, appeared to be in the same predicament as the canopy over the town: hence these observations prove, that the heavy, dense, low temperature of the atmosphere, prevented both smoke and steam from ascending as usual; and give a sufficient reason why, at that time, Leeds, Manchester, Glasgow, and other large maufacturing towns were immersed in such dark fogs. On that day the Barometer was 30,35., yesterday it was 28,62., being a depression of 1 in. 73, or a diminution of seven eigths of a pound weight on every square inch of surface.

In my meteorological notice of the 23rd of October, I said, I had reason to suppose we were going to have a Storm of an extensive kind. In the "Illustrated London News" of November the 23rd, you will find a letter from Mr. T. Waterman, (in which be gives an account of the loss of the Emperor of Russia's steam yatch "Peterhoff,") the following passage, "We passed the Archimede, a Prussian steam "vessel, that went ashore a few days ago on the island of Bornholm. "We had no sooner left the island than it blew a perfect hurricane, "and continued blowing until the morning of the 24th of October."

| DAY. | DATE. 1850. | | BAR. | HOUR. | NIGHT WD. THER. |
|---|---|---|---|---|---|
| W. | Nov. 27. | 3 SIGNALS 6 p.m. rainy afternoon | 30,03 | 9½p.m. | |
| T. | " 28 | Snow showers | 30,28 | 10 a.m. | 29½ W. |
| | | 2 SIGNALS 5½ p.m. | 30,45 | 9½p.m. | |
| F. | " 29 | Brilliant day | 30,46 | 10 a.m. | 22 S.W. |
| | | | 30,43 | 9½p.m. | |
| S. | " 30 | Brilliant, frosty day | 30,35 | 9½a.m. | 19 S.W. |
| | | | 30,28 | 10 p.m. | N.W. |
| Sunday | Dec. 1st | Overcast morning | 30,29 | 10 a.m. | 20 S.W. |
| | | | 30,31 | 9½p.m. | S.S.W. |
| M. | " 2 | After stormy night grey morning.. | 30,27 | 9½a.m. | 26 S.W. |
| | | Dark stormy night | 30,26 | 9 p.m. | S.W. |
| T. | " 3 | Grey morning and fine day | 30,11 | 9½p.m. | 22 S.W. |
| | | Stormy starlight night | 30 | 9 p.m | |
| W. | " 4 | Dark rainy morning | 29,89 | 10 a.m. | 23 S.W. |
| | | Fine afternoon, fine starlight night | 30,06 | 10 p.m. | |
| | | 4 SIGNALS FROM 7 TO 10 P.M. | | | |
| T. | " 5 | Grey morning and fine afternoon | 30,09 | 10 a.m. | 24 S.W. |
| | | Warm, calm, starlight night | 30.20 | 9 p.m. | |
| | | 4 SIGNALS FROM 5 TO 9 P.M. | | | |
| F. | " 6 | Brilliant cloudless morn. like spring | 30,37 | 10 a.m. | 38 W. |
| | | Calm sea like a glass. Beautiful day with saffron horizon. | | | |
| | | Fine, calm, starlight night | 30,39 | 9½p.m. | |
| S. | " 7 | Brilliant cloudless day | 30,37 | 8½a.m. | 32 S.S.W. |
| | | Fine starlight night | 30,36 | 10 p.m. | S.S.W. |
| Sunday | " 8 | Brilliant cloudless day | 30,35 | 9 a.m. | 29 S.S.W. |
| | | Fine starlight night | 30,35 | 10 p.m. | |
| M. | " 9 | Brilliant, cloudless, calm day | 30,35 | 10 a.m. | 24 S.W. |
| | | Saffron horizon during the afternoon. Fine starlight night | 30,34 | 9½p.m. | |
| T. | " 10 | Brilliant, cloudless, hoar frosty mrn | 30,35 | 10 a.m. | 23 S.W. |
| | | | 30,17 | 1 p.m. | |
| | | Windy starlight night | 30,05 | 9½p.m. | |
| W. | " 11 | Sunny morning with clouds S.W. gl | 29,89 | 10 a.m. | 23 S.W. |
| | | Overcast stormy night | 29,75 | 9½p.m. | |
| T. | " 12 | Dark grey morning | 29,76½ | 10 a.m. | 30 S.E. |
| | | Fine starlight night | 29,76½ | 9½p.m. | |



| | | | | | |
|---|---|---|---|---|---|
| | | 5 SIGNALS FROM 6 TO 9½ P.M. | | | |
| F. | December 13 | After stormy night, fine overcast morning | 29,73 | 10 a.m. | 30 S.W. |
| | | Windy overcast night | 29,47 | 10 p.m. | |
| S. | " 14 | Brilliant morning | 29,41 | 10 a.m. | 31 S.W. |
| | | S.W. Stormy afternoon with showers of hail and rain | 28,91 | 5 p.m. | |
| | | Fine starlight night | 28,92½ | 10 p.m. | |
| Sunday | " 15 | After stormy night brilliant morn. | 28,91½ | 10 a.m. | 30 W. |
| | | Grey still night | 28,67 | 9½p.m. | |
| M. | " 16 | After stormy night brilliant morn. | 28,66 | 10 a.m. | 31 N.W |
| | | Fine, still, hazy night | 28,62 | 10 p.m. | |

N.B. The observations of the wind were taken from Whitby Lighthouse from 10 to 11 a.m., and 3 to 4 p.m.

George Merryweather, M.D.

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No. 31. Whitby, December 17th, 1850. Tuesday, 6 p.m.

I have just time to say, that my signals are at work, although it has been such a fine day, and at present still; yet from the low state of the Barometer, I think we shall, soon, have a Storm of some violence, either here or in other parts.

I am sorry that my letter to you of this morning, is gone, or I could have appended this notice to it.

George Merryweather, M.D.

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No. 32. Whitby, December 23rd, 1850.
Monday Morning.

My last notice to you of the weather, was dated on Tuesday Evening, the 17th instant, which was soon followed by a roaring sea, and a Stormy week, with intermissions.

I hope you witnessed the rising sun this day, and the "rosy morn."

I have now passed through my year of probation, and I trust I have gone through the ordeal to the satisfaction of all. I now only wish you a merry Christmas, and to conclude the whole matter with promising you fine weather for the approaching festive season.

George Merryweather, M.D.

## CHAPTER II.

NOTWITHSTANDING the gigantic progress which has been made in various branches of science, it is most extraordinary, that, at the present age of the world, no discovery should have been made, to turn to account for the benefit of mankind, one of the greatest marvels of the creation.

Although the subject of animal instinct has had the attention of the learned men of all nations drawn to it; and who have furnished us with the most interesting and wonderful accounts of its phenomena: I am ignorant of any good purpose to which it has been applied. Hitherto, it has only been made use of as an engine of destruction.

Before I proceed, it will be necessary to bring before you, what has been written on this subject by the best authorities, which I shall do, by quoting passages from their writings. I have a fourfold object in doing this, namely. To place before the mind, on the present occasion, the mighty powers of animal instinct:—to exalt in your estimation the subject of the present



Essay:—to exhibit to you, the successful results that have been attained by the application of a single individual:—and last of all, to encourage and induce other minds, to follow and persevere in similar investigations; which will be found to be one of the most instructive, as well as the most delightful studies that can occupy the human mind.

The late Sir Charles Bell, whose splendid Treatise on the Nervous System will immortalize his name, says, "A notion prevails that the young of the lower animals "are directed by instinct, but that there is an exception "in regard to the human offspring: that in the child "we have to trace the gradual dawn and progressive im- "provement of reason. This is not quite true; we "doubt whether the body would ever be exercised under "the influence of reason alone, and if it were not first "directed by sensibilities which are innate or instinct- "ive."

"The sensibilities and the motions of the lips and "tongue are perfect from the beginning; and the dread "of falling is shewn in the young infant long before it "can have had experience of violence of any kind."

"The hand, which is to become the instrument for "perfecting the other senses and developing the endow- "ments of the mind itself, is in the infant absolutely "powerless."

"Now, although the infant is capable of an ex- "pression of pain, which cannot be misunderstood, and "is the same which accompanies all painful impressions

"through life, yet it is unconscious of the part of the "body which suffers. We have again recourse to the "surgeon's experience. There occur certain congenital "imperfections which require an operation at this early "stage of life; but the infant makes no direct effort "with its hand to repel the instrument, or to disturb the "dressing, as it will at a period somewhat later."

"The lips and the tongue are first exercised: the "next motion is to put the hand to the mouth, in order "to suck it: and no sooner are the fingers capable of "grasping, than whatever they hold is carried to the "mouth. So that the sensibility to touch in the lips "and tongue, and their motions, are the first inlets to "knowledge; and the use of the hand is a later ac-"quirement."

"Next in importance to the sensibility of the mouth, "we may contemplate that sense which is early exhibi-"ted in the infant,—the terror of falling. The nurse "will tell us that the infant lies composed while she "carries it in her arms up stairs; but that it is agitated "in carrying down. If an infant be laid upon the arms "and dandled up and down, its body and limbs will be "at rest, whilst it is raised; but they will struggle and "make an effort, as it descends. There is here the in-"dication of a sense, an innate feeling of danger, the "influence of which we may perceive, when the child "first attempts to stand or run. When the child is set "upon its feet, and the nurse's arms form a hoop around "it without touching it, it slowly learns to balance itself



"and stand; but under a considerable apprehension. "Presently, it will stand at such a distance from the "nurse's knee, that if it should lose its balance, it can "throw itself for protection into her lap. In these its "first attempts to use its muscular frame, it is directed "by an apprehension. By degrees it acquires the "knowledge of the measure of its arm, the relative dis-"tance to which it can reach, and the power of its "muscles. Children, therefore, are cowardly by in-"stinct: they show an apprehension of falling; and "we may gradually trace the efforts which they make, "under the guidance of this sensibility, to perfect the "muscular sense. In the mean time, we perceive how "instinct and reason are combined in early infancy: "how necessary the first is to existence: how it is sub-"servient to reason, until it becomes obscured that we "can scarcely discern its influence."*

Although the human being, when first ushered into the world, may be the most helpless of all creatures, he bears that instinctive impression, which has been stamped upon him by the Great Creator of the universe, whereby, it is apparent, that his instinct teaches him *precaution;* and also exhibits, that he was created for progression by his innate extacy at elevation or ascension, and his instinctive dread of degradation or falling.

To proceed with the subject I continue to quote from the same learned and sagacious author, the following— "The late Sir Joseph Banks, in his evening conversa-

* Bridgewater Treatise, p. 228.

"tions, told us that he had seen, what many perhaps "have seen, a chicken catch at a fly whilst the shell "stuck to its tail. Sir Humphrey Davy relates that a "friend of his, having discovered under the burning "sand of Ceylon the eggs of an alligator, had the "curiosity to break one of them; when a young alliga- "tor came forth, perfect in its motions and in its "passions; for although hatched under the influence of "the sunbeams, in the sand, it made towards the water, "its proper element: when hindered, it assumed a "threatening aspect and bit the stick presented to it. "We may therefore conclude, that as animals have "propensities implanted in them to perform certain "motions, to which their external organs are subservi- "ent, so their passions or dispositions are given as the "means of directing them how to defend themselves or "obtain their food."

"But this has been well said seventeen hundred "years ago. 'Take,' says Galen, 'three eggs, one of "'an eagle, another of a goose, and the third of a viper: "'and place them favourably for hatching. When the "'shells are broken, the eaglet and the gosling will at- "'tempt to fly; while the young viper will coil and "'twist along the ground. If the experiment be pro- "'tracted to a later period, the eagle will soar to the "'highest regions of the air, the goose betake itself to "'the marshy pool, and the viper will bury itself in the "'ground.'"*

* Bridgewater Treatise, p. 252.



The pious naturalist, the Rev. William Kirby, says, "When we leave the vertebrated animals, we find the "nervous system, in most, materially altered and de- "graded, so that more power is given apparently to "instinct and less to intellect. In other animals, as we "descend, the nervous system becomes more and more "dispersed, so that in those at the foot of the scale we "discern no traces of intellect, and very few of instinct; "and only so much apparent sensation as is necessary "for the purposes of nutrition and reproduction. I "have made the above observations because they bear "in some degree on the question now before us. For "if we pay due attention to the proceedings of animals, "we shall find that those whose nervous system is "cerebral usually exhibit the most striking proofs of "intellectual action, are most capable of instruction, and "are less remarkable for the complexity and intenseness "of their instincts; while those of the next grade, whose "nervous system is ganglionic, as far as we know them, "though not devoid of intellect, are endued with a "much smaller portion of it, while their instinctive "operations are all but miraculous, and that where the "nervous system is still less concentrated both are "greatly weakened, till at the bottom of the scale they "almost disappear. From hence it seems to follow that "extraordinary instinctive powers are not the result of "extraordinary intellectual ones.

"But when we reflect further, that even in cases "where the instincts are most complex and wonderful,

"the animal practises them *infallibly*, without guide or "direction, and is as expert at them when it first "emerges into life, as when it has been long engaged "in the practice of them; it follows that it must be in- "structed in them from the first moment of its existence "in the state in which it exercises them by an infallible "teacher. The bee, the moment it emerges from the "pupa, begins to collect honey and pollen, and to per- "form all the other manipulations that belong to her "instincts."*

"Yet, though the immediate agent that guides the "swallow over the expanse of water, from the torrid "to the temperate zone is latent, we still inquire, when "she has made the shores of Britain, what is it that "urges her to seek her old vicinity, and to build her nest "in the very spot where she herself first drew breath, as "Dr. Jenner's experiments prove that swallows do?"†

"But of all the instincts of the feathered part of the "creation, there is none more remarkable, more varied, "and more worthy of admiration than that which directs "them in the situation and structure of their nests. "One nidificates upon the ground; another under the "ground, or in sand; some select the chimney or eaves "of houses for their clay-built structures; those gela- "tinous nests, which the Chinese epicures and orators "so highly prize, are formed in caverns and dark places "by the little bird whose work they are. The great "majority nidificate in trees and bushes, and where they "are within reach their nests are carefully concealed.

* Bridgewater Treatise, Vol. 2, p. 235. † p. 262.



"The structure and materials of nests are also in- "finitely various, and may be considered to result, as "well as all the proceedings of animals with regard to "their young, from an excitement analogous to that "which Dr. Jenner first noticed in the swallow, upon "which he observes, 'The economy of the animals "'seems to be regulated by some *external* impulse which "'leads to a train of consequences,' and which does not "cease its action till it has accomplished the end for "which it was given, namely, the procreation; oviposi- "tion preceded by nidification; incubation; hatching "or birth; nutrition and education of the young pro- "geny of each individual kind, according to the general "law of the Creator."*

"With regard to Fishes the general object of those "that migrate appears to be the casting of their spawn; "this it is that causes the different species of salmon "genus to leave the sea for the rivers; for this the "herring travels southward, and the mackrel seeks the "north; all of them guided by the law of the Most "High, shewing itself by an indomitable instinct, to "seek those stations for oviposition that are best suited "to the aëration, hatching, and rearing of their spawn."†

A few years ago, Mr. John Shaw, gamekeeper to the Duke of Buccleuch, made a series of interesting experiments concerning the instincts and habits of the salmon and sea-trout, which in part, are so analogous to the instincts of the swallow, that I copy the following from "Blackwood's Magazine, vol. liii, p. 650, May, 1843."

* Bridgewater Treatise, Vol. 2, p. 263. † p. 265.

"As herlings (sea-trout in their third year) abounded "in the river Nith during the summer of 1834, Mr. "Shaw marked a great number (524) by cutting off the "adipose fin. 'During the following summer (1835) "'I recaptured sixty-eight of the above number as sea-"'trout, weighing on an average about two and a half "'pounds. On these I put a second distinct mark, and "'again returned them to the river, and on the next "'ensuing summer (1836) I recaptured a portion of "'them, about one in twenty, averaging a weight of four "'pounds. I now marked them distinctly for the third "'time, and once more returned them to the river, also "'for the third time. On the following season (23rd "'day of August, 1837,) I recaptured the individual "'now exhibited for the fourth time.' (The specimen "is preserved in the Museum of the Royal Society of "Edinburgh. It then weighed six pounds.) "This is "indeed an eventful history, and we question if any "salmo trutta ever before felt himself so often out of "his element. However, the individual referred to "must undoubtedly be regarded as extremely interest-"ing to the naturalist. It exhibits at a single glance, "the various marks put upon itself and its companions, "as they were successively recaptured, from year to "year, on their return to the river—viz. 1st, The "absence of the adipose fin, (herling of ten or twelve "ounces in 1834.) 2ndly, One-third part of the dorsal "fin removed, (sea-trout of two and a half pounds in "1835.) 3rdly, A portion of the anal fin clipt off,



"(large sea-trout of four pounds in 1836.) In the 4th "and last place, it shows, in its own proper person, as "leader of a forlorn hope of 1837, the state in which "it was finally captured and killed, of the weight "of six pounds. It was in its sixth year, and, re-"presenting the adult condition of this migratory "species, we think it renders further investigation "unnecessary.

"From these and other experiments of a similar "nature Mr. Shaw has been conducting for many years, "he has come to the conclusion that the small fry called "'Orange-fins,' which are found journeying to the sea "with smolts of the true salmon, are the young of sea-trout "of the age of two years;—that the same individuals, "after nine or ten weeks' sojourn in salt water, ascend "the rivers as herlings, weighing ten or twelve ounces, "and on the approach of autumn pass into our smaller "tributaries with a view to the continuance of their "kind;—that, having spawned they re-descend into the "sea, where their increase in size (about one and half "pound per annum) is almost totally obtained;—and "that they return annually, with an accession of size, "for several seasons, to the rivers in which their parents "gave them birth. In proof of this last point, Mr. "Shaw informs us, that of the many hundred sea-trout "of different ages which he has marked in various "modes, he is not aware that even a single individual "has ever found its way into any tributary of the "Solway, saving that of the river Nith."

The intelligent naturalist, Swainson, has written well on animal instinct. "We must admit that the bee, "for instance, is guided in her wonderful operations, by "an acquaintance with those principles of science which "man has required time and reflection to discover. We "must, in short, acknowledge her both a geometrician "and a philosopher; and endue her with a perception "of causes and effects, inconsistent with the other "habits and appearances of the creature, absolutely "derogatory to the superior nature of man."*

"The operations of instinct are limited to those cir- "cumstances which tend only to keep the species in the "same state of intelligence in which it was born. There "is no progressive advancement, in succeeding genera- "tions, by which a higher advance is made, either by "the communication of experience, or the effects of "example, in higher animals. Each species has its "own limited range; and there its powers cease. The "ox, which "knew his master's crib," and followed the "patriarchs in their journeys, four thousand years ago, "was no less intelligent than those of the present day; "and the dogs of Nimrod were, probably, as far advanced "in civilisation as those possessed by our modern "hunters. The wild ass of Scripture—which was, prob- "ably, the zebra—is still the same untameable in- "habitant of the desert; and all the efforts of man to "make him obedient to the curb have been utterly fruit- "less. The hen does not discriminate between a real

* Habits and Instincts of Animals, p. 2.



"and an artificial egg; and the tomtit will go on build- "ing her nest in the same hole, after it has been "destroyed four or five times. These, and a thousand "similar instances, may be cited, to illustrate what we "have just advanced."*

"Such then, are the operations of instinct. In de- "fining them, we have also given their ultimate results. "They tend to nothing more than the economy of the "present life: they have no relation to the improvement "of existing communities, or the transmission of know- "ledge to succeeding generations: each individual, "however highly gifted by nature, or improved by art, "passes away, and is forgotten. The end of its creation "in the economy of nature, is fulfilled: it has had all "the enjoyment of animal life, which from its nature, "it was alone capable of receiving;—it followed its own "appetites, its own wishes, and its own will. No con- "sciousness of moral obligation or responsibility was "given to it when alive, therefore there remains no "ultimate object to be accomplished after death.†

"The operations of reason, again, are very different "from those of instinct; it commences not, like the "latter, in early infancy,—but is of slow growth. There "is nothing to contradict the hypothesis—that all the "powers of instinct an animal will ever possess, are "given to it so soon as it quits the sustenance it may "derive from the parent, and begins to provide for "itself. It will be observed, that a kitten is just as wary

* Habits and Instincts of Animals, p. 7. † Ibid. p. 9.

"and cunning at catching such birds and mice as it can "conquer, as is its mother; and a young duckling will "swim, dive and procure its own food, with the same "ease and expertness as its parents. But the operation "of reason, as every one knows, is quite different. It "is dormant at an age when the animal instincts have "long begun to show themselves; and only awakens, "and asserts its claim to be heard, when the passions "and the inclination of advanced youth require that "direction and control which it was intended to exercise. "But, although it comes slowly into being, and is after- "wards always liable to be affected by the infirmities of "the body, its growth is not for time but for eternity. "It may be clouded by anxiety, dimmed by sickness, or "perverted by evil; but still it does not, of necessity, "permanently lose its force, as do several of the animal "instincts, in proportion to the decay of the body. This "is certain;—that the powers of reason, in sane and well "regulated minds, are in their full vigour and expansion, "long after the animal functions of the body have begun "to decay; and that innumerable instances might be "quoted, of the reasoning mind preserving all its depth, "and acuteness, and discrimination, when the animal man "is fast approaching that age which the Psalmist has "measured out. To all but the Christian philosopher, "who inwardly feels that MIND is indestructible, and "therefore immortal, nothing can be more depressing, "inconsistent, and unaccountable, than to see those "favoured beings, who have been gifted with a high



"development of this faculty,—and which they are "employing for the good of others,—gradually sinking "into old age and decrepitude, at a time when their "mind, although clouded by a diseased body, is still "sending forth rays of genius and of wisdom,—the "accumulated results of thoughtful experience and "calm deliberation.

"The whole of the animal races show us that every "thing is perfection in its kind; that, so soon as one "part of the animal frame begins to decay, all the others "evince the same propensity; and that no one creature "exhibits a deviation from this rule, but that which has "been pronounced the most perfect—MAN. Old age "deadens all the animal faculties, but leaves the mental "sound, hale, and even in a yet expanding progress; "the oil burns with brightness, while the earthen lamp "that contains it is fast mouldering to its parent dust. "Why is this inconsistency? Clearly, because the one "is indestructible, and the other perishable. The former "is still to grow on in another and brighter world, un- "shackled by a companionship with animal instincts."*

A most extraordinary account of animal instinct is given by Bishop Heber, (in his journal,) when proceeding to the foot of the Himalaya mountains. His Lordship says, "I asked Mr. Boulderson if it were true that the monkeys forsook these woods during the unwholesome months. He answered that not the monkeys only, but every thing which had the breath of life, instinctively

* Habits and Instincts of Animals, p. 10, 11, 12.

deserts them, from the beginning of April to October. The tigers go up to the hills, the antelopes and wild hogs make incursions into the cultivated plain; and those persons, such as Dak-bearers, or military officers, who are obliged to traverse the forest in the intervening months, agree that not so much as a bird can be heard or seen in the frightful solitude. Yet during the time of the heaviest rains, while the water falls in torrents, and the cloudy sky tends to prevent evaporation from the ground, the forest may be passed with tolerable safety. It is in the extreme heat, and immediately after the rains have ceased, in May, the latter end of August, and the early part of September, that it is most deadly. In October the animals return; by the latter end of that month the wood-cutters and the cowmen again venture, though cautiously. From the middle of November to March troops pass and repass, and with common precaution no risk is usually apprehended."

"There is not in my opinion," says the sagacious and learned Addison, "anything more mysterious in nature than this Instinct in animals, which thus rises above reason, and falls infinitely short of it. It cannot be accounted for by any properties in matter, and at the same time works after so odd a manner, that one cannot think it the faculty of an intellectual being. For my own part, I look upon it as upon the principle of gravitation in bodies, which is not to be explained by any known qualities inherent in the bodies themselves, nor from any laws of mechanism, but, according to the best



notions of the greatest philosophers, is an immediate impression from the first mover, and the divine energy acting in the creatures."*

* Spectator, No. 120.

## CHAPTER III.

WHAT is the reason of the extraordinary multiplication of the human species during the present century? What is the cause of the superabundant population of old countries rushing to the colonies and to previously unpopulated countries? What is it, that has saved more lives, during the time of its operation, than have been destroyed by the sword, by famine, and by revolution? What is it that has almost banished during the present century, one of the direst scourges that ever afflicted humanity? What is it that has dispelled that loathsome plague, that on one day, pounced upon the offspring of doting and extatic parents, and enveloped them, in a few more, in a bloated mass of corruption, and cast their beautiful and expressive features, into oblivion for ever? What is it, that has beautified the the face of mankind, and obliterated those foul indentations from the faces of the fairest part of creation? These half dozen questions are all answered by the one single word—"VACCINATION."

Under Divine Providence, a Briton, whose persevering and untiring energy, was made the instrument of



introducing into the world a discovery, for which there is not a civilized human family but is his debtor. Among the countless thousands of foreigners, who are about to visit this country, to witness the "*Great Exhibition of all Nations*," there will be some, who will ask to behold, among all the national monuments, the one erected by a nation's gratitude to the immortal Jenner.

What Vaccination has already done for the increase of the human race; there is another measure now progressing, which will have a similar tendency; in annihilating a class of diseases, which have been regular in the destruction of the human species. It is gratifying to reflect, that the Noble Patron of our Philosophical Society was the first who commenced measures of Sanitary Reform, which are now making such rapid progress. Of all the great services that the Marquis of Normanby has rendered his country, there is none that will add a greater lustre to his name, than the persevering energy he displayed in bringing to light "the noisome pestilence" that was prevading the land, and which was encouraged, rather than checked by its inhabitants. We can already perceive, even in our own town, the benefits that have been obtained from the excellent measures that have been, so far, carried into effect, which, when fully accomplished, will make it one of the healthiest localities in Her Majesty's dominions. Whitby owes much to the wisdom and sagacity of its ancestors, in placing its church-yard upon such an

elevation; so that no danger need ever be apprehended from it injuring the health of its people. As the poison that emanates from burial grounds is of a volatile nature, it ought to be conclusive, that elevations should always be selected.

I may be pardoned this digression, when I say it was to the illustrious Jenner that I am indebted for the first idea of the "Tempest Prognosticator;" which I was led to, almost a score years since, by reading the following smart piece of poetry by that naturalist.

"SIGNS OF RAIN."

"An excuse for not accepting the invitation of a "friend to make a country excursion."

"The hollow winds begin to blow,
The clouds look black, the glass is low,
The soot falls down, the spaniels sleep,
And spiders from their cobwebs creep.
Last night the sun went pale to bed,
The moon in halos hid her head.
The boding shepherd heaves a sigh,
For see! the rainbow spans the sky.
The walls are damp, the ditches smell,
Clos'd is the pink-ey'd pimpernel.
Hark! how the chairs and tables crack;
Old Betty's joints are on the rack.
Loud quack the ducks, the peacocks cry,
The distant hills are looking nigh.
How restless are the snorting swine—
The busy flies disturb the kine.
Low o'er the grass the swallow wings;
The cricket too, how loud he sings.
Puss on the hearth with velvet paws
Sits smoothing o'er her whiskered jaws.
Thro' the clear stream the fishes rise,
And nimbly catch the incautious flies.
The sheep were seen at early light
Cropping the meads with eager bite.
Tho' June the air is cold and chill;
The mellow black-bird's voice is still.
The glow-worms, numerous and bright,
Illumed the dewy dell last night.
At dusk the squalid toad was seen



Hopping, crawling, o'er the green.
The frog has lost his yellow vest,
And in a dingy suit is dress'd.
The leech, disturb'd is newly risen
Quite to the summit of his prison.
The whirling winds the dust obeys,
And in the rapid eddy plays.
My dog, so altered in his taste,
Quits mutton bones on grass to feast.
And see yon rooks, how odd their flight,
They imitate the gliding kite,
Or seem precipitate to fall,
As if they felt the piercing ball.
'Twill surely rain—I see with sorrow,
Our jaunt must be put off to-morrow."*

Out of this category of animal instinct, I am not going to introduce to you either toads or frogs, or even "Old Betty's joints," but a little animal, whose name Sir Walter Scott revived and was so fond of applying to his medical heroes in his enchanting novels. This sagacious writer must have been aware of the wonderful powers of the *Leech* for observation, that caused him to designate Medical men by its name. There is another celebrated poet who has passed a deserving eulogium on the instincts of this little creature, which Cowper communicated in a letter to his cousin Lady Hesketh, November 10th, 1787, from which I make the following extract. "Mrs. Throckmorton "carries us to-morrow in her chaise to Chicheley. "The event must however be supposed to depend on "the elements, at least on the state of the atmosphere, "which is turbulent beyond measure. Yesterday it "thundered, last night it lightened, and at three this "morning I saw the sky red as a city in flames could "have made it. I have a Leech in a bottle that

* Dr. Baron's Life of Jenner, Vol. 1, p. 22.

"foretells all these prodigies and convulsions of nature. "No, not as you will naturally conjecture, by articulate "utterance of oracular notices, but by a variety of "gesticulations, which here I have not room to give "an account of. Suffice it to say, that no change "of weather surprises him, and that in point of the "earliest and most accurate intelligence, he is worth all "the barometers in the world. None of them all indeed "can make the least pretence to foretell thunder—a "species of capacity of which he has given the most "unequivocal evidence. I gave but sixpence for him, "which is a groat more than the market price, though "he is in fact, or rather would be, if leeches where "not found in every ditch, an invaluable acquisition."*

One of the favourite occupations of the leisure moments of my life has been the study of *Caloric;* as a proof of which, I had the good fortune nineteen years ago, while a student at Edinburgh University, to solve the problem of the maintenance of Uniform Temperature, given out by the French Philosophers, Lavoisier, Berthollet, Morveau, and Fourcroy, when they promulgated the reform of the Chemical Nomenclature. In accomplishing this, I established the principle of supporting fire without the agency of wood or coal, and that for an indefinite period. My paper on this subject was read before the Royal Society of Edinburgh at the time. In the year 1839, I produced a series of propositions on the nature of Caloric, which were read before

* Hayley's Life of Cowper, Vol. 3, p. 73.



this Society, and afterwards taken notice of by the late Rev. Dr. Young, and were published by him in the York papers of the day.

In later years it occurred to me, that I might derive some useful instruction concerning the actions of Caloric, by studying Animal Instinct; and from what I knew of the instinctive powers of the Leech, I imagined, I might discover some latent processes that were going on in the atmosphere; and thereby introduce a new principle into science. Having a knowledge of these powers, it only required two other elements,—time and perseverance. I therefore undertook to analyze all the movements of the Leech, in order to select only those that were essentially valuable as prognostics of meteorological phenomena.

It would be tedious, as well as unnecessary, to relate all the experiments I performed: I hope therefore, it will suffice, if I only record those that proved to be successful. As I am no friend to cruelty in any form or shape whatever, my first consideration was, in experimenting upon Leeches, to avoid as much as possible, interfering with their habits.

In my first experiments, I was desirous of ascertaining, whether a number of Leeches kept separately, and placed under similar circumstances, would simultaneously give indications of thunder. I found this not to be the case: some appeared to be more sensitive and more prophetic than others; and some appeared to be absolutely stupid. I was, however, convinced of

the truth of what the poet Cowper has said with respect to thunder; and although no thunder may take place near where the Leeches are, still, I discovered that they take cognizance of it, if it occur at great distances. As an instance of this assertion. On Thursday, the 7th of August, 1849, I had occasion to take a journey, of about fifteen miles west of Whitby. Although it was a beautiful morning, I had before my departure distinct indications from the actions of my Leeches, that a storm of some kind, was going to take place. In two hours I arrived at Danby Beacon, (about 1000 feet above the level of the sea,) where the sun was shining, and I then beheld, from that elevation, one of the most sublime sights I ever witnessed: the hills from Glazedale to Kildale were crowned with the blackest nimbi I ever saw; forming an amphitheatre of from twelve to sixteen miles in extent, from which issued forked lightning and roaring thunder: and between Rosedale and Westerdale were two water-spouts discharging from the base of the clouds: one of inky blackness, and like an inverted steeple; the other not so dark, but spiral towards its apex. This grand scene reminded me of one of Martin's paintings. When I returned to Whitby in the evening, I found that the day there, had been perfectly fine throughout; and that no lightning had been seen, nor any thunder heard.

I was thus confirmed in my previous observations, that it is not thunder which acts upon the Leech, but the electrical state of the atmosphere, which precedes



thunder; and for that state of the air, all my experiments tend to prove, Leeches have, (if I may be allowed the expression,) the most remarkable sympathy. It was thus I found out, that before a Storm could take place, there must be a preparatory process in the atmosphere, of which the Leech gives unequivocal evidence: and this I found it to do when the weather was fine and undisturbed. Having obtained this fact, I found myself in the predicament of a self-constituted judge, I therefore took it into my head, to surround myself with a jury of philosophical Counsellors, which was composed of twelve Leeches, each placed in a separate pint bottle of white glass, about 3 inches in diameter, and 7 inches in height. I then placed these bottles in a circle, in order, that the Leeches might see one another, and not endure the affliction of solitary confinement. Having already analyzed their movements, which I found to be confused and various, I contrived a method, to detach those movements, which more immediately appertained to meteorology. For this purpose I invented a metallic tube of a particular form, to insert into the neck of the bottles; to which it would be somewhat difficult for a Leech to enter; but which it *would* enter, and make every effort to do if a Storm were preparing. No air was allowed to enter the bottles, except what was admitted at the superior part of the tubes, by the means of small holes perforated in them: care being always taken that no air could enter at the sides of the tubes. These tubes were painted inside

with gum-lac, in order that they might be washed clean occasionally, with a camel hair brush, as also to prevent any metallic particles coming in contact with the Leeches.

Having thus far advanced to my satisfaction, I found I had a difficulty to contend with, and that was to know if the Leeches entered the tubes during my absence, or in the night time; for it is obvious such might occur without my knowledge, and render my experiments nugatory. Besides I should have the mortifying reflection of having neglected my duty, when my little comrades, (which I presume the author of Waverley would have allowed me to call them,) had done theirs. In this, the old adage may be truly applied, that "necessity is the mother of invention," which soon relieved me from my difficulty. I thought if I could get a Leech to ring a bell, it would be curious enough, but if I could manage to register such an operation, it would be most satisfactory. Both these objects I soon accomplished. As it would have been preposterous to have a bell for each Leech, I made use of a simple contrivance, by placing a bell upon a pedestal, erected on the centre of a circular platform; which bell was surrounded by twelve hammers. From each of these hammers was suspended a gilt chain; each of which played upon a pulley, which was placed in a disk, that was a little elevated above the circle of bottles. By this method, every Leech could have communication with the bell. One half of the metallic tubes was



left open, so that the interior was exposed: across the entrance of each, was placed a small piece of whalebone, which was held up by a piece of wire attached to its centre: these wires were passed through the aperture at the top of each tube, and then hooked on to each chain. After having arranged this mouse trap contrivance; into each bottle was poured rain water, to the height of an inch and a half; and a Leech placed in every bottle, which was to be its future residence; and when influenced by the electro-magnectic state of the atmosphere a number of the Leeches ascended into the tubes; in doing which, they dislodged the whalebone, and caused the bell to ring.

The apparatus being now ready for action, I beheld an Atmospheric, Electro-magnectic Telegraph, which would communicate to me, at all times, processes that were taking place in the higher regions of the atmosphere, and for hundreds of miles in extent; and would enable me to foretell, with unerring certainty, any Storm that was preparing to take place. The Leeches appear to be invited to mount into their respective belfries, to participate in that discharge or descent of free caloric, termed electro-magnetism, which had previously been carried up into the atmosphere by evaporation and radiation. Although I am somewhat prepared to proceed with this part of the investigation, it would, not at present, be in accordance with the line of demarcation I have prescribed to myself, to embarass this Essay with any abstruse matter. I therefore proceed to say, that

instead of naming this apparatus an Atmospheric, Electro-magnetic Telegraph, conducted by Animal Instinct, it would be better to give it a name, which would convey at once, to the mind of the people of all nations its objects: hence, I have designated it the "Tempest Prognosticator," two words expressive enough for all foreigners to understand.

I may here observe, that I could cause a little Leech, governed by its instinct, to ring Saint Paul's great bell in London, as a signal for an approaching storm. The apparatus I have produced, of which the Vouchers for the whole of last year, prove its efficacy, justify me in making this assertion.

## CHAPTER IV.

In scientific pursuits, it sometimes occurs that contemporaneous investigations are taking place in different countries, on the same subject; which often lead to much silly uproar, as to whom shall be awarded the honour of the originality of a discovery. This is what a certain class in the world delights to be amused with; but which is, indeed, derogatory to science.

It has so happened, that two French Philosophers were pursuing, at the same time, with myself, investigations concerning the electricity of the atmosphere: which only became known to me in March of last year; and which communication I found in my monthly number of the "London Medical Gazette," for February, which I received at the beginning of the month following.

Although the beautiful scientific researches of those Gentlemen, do not interfere with my experiments; I sincerely hope, that mine may produce upon their minds, the same satisfaction, that theirs have done on my own: for their experiments, in part, corroborate those which

I have performed; and it is to be hoped that mine, may be, in some measure, considered confirmatory of theirs.

I feel myself fortunate that the experiments of M. M. Pelletier and Quetelet have undergone the supervision of one of the greatest practical Philosophers of the age, and one, who is an honour to the British Nation. I here subjoin entire the paper I have alluded to.

Royal Institution, February 1st, 1850.

## ON THE ELECTRICITY OF THE AIR.

By Professor Faraday.

Professor Faraday this evening introduced and expounded the hypothesis of M. Pelletier, respecting the electrical relations of the earth and its atmosphere to the planetary space in which it moves.

The mode in which the electricity of the atmosphere was discovered by M. Pelletier and Quetelet, was shown by Dr. Faraday experimentally. The instrument employed by these investigators was a brass globe placed on a thin metallic stem, to which is affixed a delicate galvanometer needle, which indicates, by a minute measurement in degrees, the amount of electricity obtained. This instrument was used by the experimentalists, on the summits of high buildings, where it was above every surrounding object The method formerly adopted was to employ for this purpose a long metallic rod, furnished with points which projected into the air to be examined M. Pelletier's mode gives the quantity and the kind with certainty, while the old method furnishes uncertain and often contradictory results.

Dr. Faraday illustrated by enlarged models, the influence of various degrees of elevation on M. Pelletier's electrometer; at the same time showing that no changes take place from variation of position when the instrument is moved horizontally, and that thus throughout each stratum the electricity of the air is the same. It is the vertical elevation or depression which produces a marked difference. The results obtained by M. Pelletier, are—



1. That the electricity of the air increases with the distance from the surface of the earth—a fact of great importance, as it influences the determination of the question, whether the electricity of the earth be derived from planetary space, as Pelletier affirms, or whether, as Professor Faraday thinks, it be the results of various processes taking place on the surface of the earth.

2. The measure of divergence of the electrometer being the measure of force, it was found from a series of daily observations extending over a period of five years (1844-8), that the quantity of electricity at the same place undergoes a regular increase and decrease in certain months of the year; and contrary to the general belief, the quantity of electricity is at its maximum in winter, and undergoes a decrease until it finds its minimum in June, and then again rises to its maximum in the succeeding January.

The subjoined table represents the numerical results; and from this it will be seen, that at the same level, the quantity of electricity in the atmosphere is twelve times as great in the cold month of January as in the hot month of June.

Average of five years 1844-8.

| MONTHS. | QUANTITY OF ELECTRICITY. |
|---|---|
| January .... (maximum) | 605 |
| February | 378 |
| March | 200 |
| April | 141 |
| May | 84 |
| June .... (minimum) | 47 |
| July | 49 |
| August | 62 |
| September | 70 |
| October | 131 |
| November | 209 |
| December | 507 |

3. *The influence of the sky.*—From the results under this head it is made evident that the highest degree of electricity is not found in cloudy weather, but in the clear, serene sky, i. e. at a time when the atmosphere is free from clouds. Thus for the whole year the pro-

portional *quantity* may be represented; cloudy 186, clear 273. In reference to the monthly variations, as influenced by the state of the sky, it was found that in January, the maximum month of the year, the proportionate quantities are, clondy 268, clear 1133. Only one exception, for an equal number of cloudy and clear days, was met with to this rule, viz. in July: the electricity on the cloudy days was 41, on the clear days 35.

4. As regards fog, snow, and rain, it was observed that the amount of electricity was the same during the two former states of weather, and was double that observed during rainy weather. The latter corresponding to the minimum of the annual electricity, the former to the maximum of the year.

5. *As to the kind of electricity in the air.*—It was noted that during a period of five years, only twenty-five observations gave evidence of resinous or *negative* electricity; the rest, consisting of 1800 observations, indicated vitreous or *positive* electricity. The negative observations were all recorded after storm or rain, or some other great meteorological change. The normally electrical state of the atmosphere may therefore be considered as *positive*.

6. *Wind.*—It was observed that when the wind was E.S.E., or S.E., two *maxima* were regularly formed, and two *minima* when at W.S.W., or S.W.; and that these corresponded with the other variations which have been mentioned.

7. The diurnal variations were recorded during the same period of five years, from six o'clock in the morning until nine at night. The degrees of divergence showed thus that there were two maxima and two minima daily. The maxima were at 8 a.m., and from 8 to 9 p.m., corresponding to the maxima of barometrical elevation, but in opposite periods to the magnetical maxima. One minimum was from 2 to 4 p.m., the other probably during the early morning hours.

All those great and regular phenomena of the atmospheric electricity, Dr. Faraday observed, are phenomena of *static electricity*, while the thunder storm, the St. Elmo light, &c., are the exceptional instances of *current* or *dynamic electricity*; not necessarily, however, requiring clouds for its concentration or evolution.



The Professor concluded, by expressing his dissent from the theory of M. Quetelet, that the electricity of the earth was negative, and that the planetary space positive. According to this theory the only true electricity is the negative, i.e., that produced by the friction of resinous substances, while the positive electricity is merely the absence or negation of electricity. It thus reverses all our common notions of electrical science. Dr. Faraday observed that while admitting to the very fullest extent the value of the observation and investigations of M. M. Pelletier, and Quetelet, which he brought before the audience, he nevertheless could not receive the hypothesis they had framed thereon.*

It has been the common notion that the greatest amount of electricity in the atmosphere, is in the summer months of the year; but the experiments of M. M. Pelletier and Quetelet, and my own, prove the reverse to be the case, there being the most in the winter months. If you examine my Vouchers for May, June, July, and August, of last year, you will find the signals to be very few; and in accordance with the minima electrical experiments of those French Gentlemen.

In my next Essay, (which will be a second part to the present one,) I shall endeavour to prove to you, that atmospheric electricity is derived from the Earth, and not from planetary space: I was glad to find that Professor Faraday is of this opinion.

I shall also endeavour to explain to you, the infinite wisdom of the Omnipotent, in the regulation of that imponderable essence—Caloric, which is an agency of such mighty power in all the phenomena of Nature:

* London Medical Gazette, Vol. xlv. February, 1850, p. 255.

and how dreadful would be the consequences, if the same amount of electricity pervaded the air in summer, as that which prevails in winter.

It is the same agency which is concerned in the formation of ice, which has to obey certain infallible laws, or all water would be, below a certain temperature, converted into a solid mass at once, and not gradually; and likewise, a reverse action would take place, in ice returning to water suddenly, instead of by degrees. All these latent preparatory processes cause me to look to the Great Creator with wonder and adoration. And if science had no other objects, this alone, would be, to my mind, a superlative satisfaction.

It is also my intention to allude to the migration of animals, and I will endeavour to investigate the agency, by which the swallow is guided in such swift and extraordinary flights; and returns unerringly to its native spot. I shall likewise endeavour to ascertain the agency of that instinct, which causes the Salmon to dart into the vast ocean, and after its sojourn there, find its way back, year after year, into its native stream, and no other.

In the next place, I proceed to give you the natural history of the Leech itself. As I find the best account in one of Chambers's excellent publications, I shall extract the account in full, because of the able and correct manner in which it is written.

"The order Suctoria contains the common Leech and "its allies, which are animals of aquatic habits, but not



"all agreeing in its blood-seeking propensities. Most of "the tribe, however, live at the expense of some other "animal. Sometimes they attach themselves to fishes "or aquatic reptiles; sometimes they devour Mollusca, "Annelida, or the larvæ of insects; and certain species "seem to flourish only whilst sucking the blood of higher "animals. No external organs of respiration are seen on "their bodies, but a large number of minute sacs are "contained in their skin, into which air or water is "admitted. The skin of the common Leech is very "thin, and scarcely exhibits the division of its segments; "but the muscular envelope beneath it is more sub-"stantial, and is found to consist of three distinct strata "of fibres running in different directions, transverse or "circular, longitudinal and diagonal. By the action of "these they acquire that facility in moving in any "direction, and in altering the form and dimensions of "their bodies, for which they are so remarkable. The "Leech has a row of eight or ten simply constructed "eyes, seen as a semicircle of black points, just above "the mouth; and the surface of the sucker, in which "the mouth is placed, seems to possess a delicate sense "of touch."

"The Leech has several modes of progression. On "land, it sometimes crawls like the earth-worm; but "more commonly it advances by means of the suckers "at the two ends of the body, fixing itself by each "alternately, and advancing the foremost. In water, "however, it moves by swimming, for which it is capable

"of peculiarly adapting itself. By a contraction of the "muscular integument, the body assumes the appear- "ance of a flattened band, and in this condition the "Leech makes its way by a succession of very graceful "undulations. It frequently crawls along the sub- "aquatic surface, by the means of its suckers, in the "same manner as on land.

"The structure of the mouth of the Leech is very "interesting. It is situated in the middle of the cavity "of the anterior sucker; and three little cartilaginous "bodies, usually called *teeth*, but more properly *jaws*, "are seen to be disposed around it, in such a manner "that the three edges form three radii of a circle. "Each of these has three rows of very minute teeth at "its edge, so that it resembles a small semicircular saw. "It is embedded at its base in a bed of muscle, by the "action of which it is worked, in such a manner as to "cut into the skin,—a sawing movement being given to "each piece separately. It is in this manner that the "tri-radiate form of a leech-bite is occasioned, each ray "being produced by a separate little saw. The lacerated "character of the wound is very favourable to the flow "of blood, which is further promoted by the vacuum "created by the sucker."

"The greater number of the Leech tribe are inhabi- "tants of fresh water; some, however, are only found "in the sea; and there is one terrestrial species, a "native of Ceylon, which appears to be more voracious "than any other, and to be one of the greatest pests



"of that fine island. It infests both mountains, woods, "and swampy grounds, particularly in the rainy season. "When fully extended, it is like a fine cord, sharp at "the extremity, and can thread any aperture; so that "it can penetrate the light clothing worn in that climate, "rendering it impossible to pass through the woods "without being covered with blood. Dr. Davy counted "fifty upon the same person. No sooner does an in- "dividual stop, than, as if they saw or scented him, "they crowd towards him from all quarters. Other "animals besides man suffer severely from them; horses "are rendered so restive by their attack as to become "quite unmanageable."*

I must here add an account from Cuvier, as it bears so much on the present subject, in exhibiting the attachment of one of the Leech family to an animal universally known to be electrical.

"There is a parasite on the Torpedo, named *Bran- "chillion*, very similar to a Leech, but which appears to "have a little mouth at the hind border of its anterior "disc, which last is borne on a slender neck, and at the "base of it is a small hole. The lateral edges of its "folds, which are compressed and salient, have been re- "garded as branchiæ, but I cannot perceive vessels "ramifying upon them; the epidermis is ample, and "envelopes the creature like a loose sac."†

It must be observed that the Leech is hermaphrodite, therefore is capable of living alone.

* Chambers's Rudiments of Zoology, p. 321. † Cuvier, p. 399. 1840.

I was very desirous of ascertaining in what part of the Leech its wonderful meteorological powers resided, and I experienced that delight, which is only known to experimenters, when I found that it was in those minute sacs in its body. In observing their movements in entering the tubes, and in leaving them, I perceived that they stretched themselves across the bottles, forming a diametric line, just under the tubes, holding the opposite sides of the bottles by their suckers, so that the air could beat upon those sacs. It was really interesting to witness their rolling motions, as if they were subjecting their bodies to some powerful but imperceptible influence, I have often thought it must be an influence, which must affect human beings for good or for evil, but of which we do not appear to be aware.

In changing the water every fifth day, it was beautiful to observe some of them, occasionally, when dropped into fresh water, to be covered with minute silvery globules like dew-drops, caused by the emission of air from the minute sacs in their skin.

I will now tell you a pleasing little anecdote respecting Leeches, but I will premise it, by telling you another, which is better than my own, and because it bears such an analogy to mine.

"Under the head of instinct, we may here notice a "most singular story of bees, related by Stedman. We "should not have given it place, but for the general "accuracy of this traveller, and from the very pointed "manner in which its accuracy is vouched for. It will



"certainly amuse the reader, if it fails to convince him "that bees know those who live about their nests. On "one occasion, I was visited in my hut, by a neighbour-"ing gentleman, whom I conducted up my ladder; but "he had no sooner entered my aërial dwelling, than he "leaped down from the top to the ground, roaring like "a madman with agony and pain; after which he in-"stantly plunged his head into the river. I soon dis-"covered the cause of his distress to be an enormous "nest of wild bees, or *wassee-wassee*, in the thatch, "directly above my head, as I stood within my door; "when I immediately took to my heels, as he had done, "and ordered the slaves to demolish them without "delay. A tar mop was now brought, and the devasta-"tion just going to commence, when an old negro, "stepped up, and offered to receive any punishment I "should decree, if ever one of these should sting me in "person. 'Massa,' said he, 'they would have stung "you long ago, had you been a stranger to them; but "they being your tenants, and allowed to build upon "your premises, they assuredly know both you and "yours, and will neither hurt you or them.' I instantly "assented to the proposition; and, tying the old black "man to a tree, ordered my boy Quaco to ascend the "ladder quite naked; which he did, and was not stung. "I then ventured to follow; and I declare upon my "honour, that even after shaking the nest, which made "its inhabitants buzz about my ears, not a single bee "attempted to sting me. I next released him and re-

"warded him for the discovery. This swarm of bees I "afterwards kept unhurt as my body-guard. They have "made many overseers take a desperate leap for my "amusement; as I generally sent them up my ladder "upon some frivolous message, when I wished to punish "them for injustice or cruelties to the negroes,—which "was not seldom. The same negro assured me that on "his master's estate was an ancient tree, in which had "been lodged, ever since he could remember, a society "of birds, and another of bees, who lived in the great- "est harmony together. But should any strange birds "come to disturb or feed upon the bees, they were "instantly repulsed by their feathered allies; and if "strange bees dared to venture near the birds' nest, the "native swarm attacked the invaders, and stung them "to death. He added that his master's family had so "much respect for the above association, that the tree "was considered as sacred." *

If I were to say that Leeches were capable of attachment, you might well say, that everybody knew that fact: I therefore am obliged to say that Leeches are capable of affection, for after they become acquainted with me, they never attempt to bite me; but some of them, have over and over again, thrown themselves into graceful undulations when I have approached them; I suppose as an expression of their being glad to see me. I have certainly not invited any of my Patients, to be introduced as strangers to my little swarthy companions, to undergo

* Swainson's Habits and Instincts of Animals, p. 34. Voyage to Surinam, vol. 2, p. 246.



the experiment of being bitten by them; for they might have borne witness against me.

It cannot be imagined that I have been indifferent to forming a scheme for bringing into use, the "Tempest Prognosticator," as the ultimate means of protecting life and property. The question is, to whom will it prove valuable? My reply is, to the Government and to the whole Shipping Interests of the country. I therefore recommend stations to be placed all round the coasts. Let there be suitable, and responsible officers appointed to manage at such stations the "Tempest Prognosticator" and Life Boats: and let there be Tempest Signals, such as Colonel Reid has recommended in his admirable work on Storms, a book that no ship ought ever to be allowed to go to sea without, and which I would advise all mariners to study, Had I the power, I should like such a man as Colonel Reid to be the Inspector of these stations: I would also seek the aid of such a steady persevering observer as Mr. Glaisher. I have no personal acquaintance with these gentlemen: I merely express my admiration of their talent. If we had such a staff of officers, aided by such means, it is impossible to estimate the advantages and blessings that would be obtained to the British Nation.

There are negations in my experiments, which will be valuable to Agriculture. If you refer to the Vouchers No. 23 and 32, you will find I ventured twice to predict fine weather, which predictions were fulfilled in a marvellous degree. If I were a Clergyman in a rural dis-

trict, I would have a "Tempest Prognosticator" to benefit my parishioners, for I am sure they would think better of me, if I could aid them in temporal matters, as well as spiritual.

I always consider myself happy in following the paths of men of genius and talent; I therefore have only to say in reply to the questions about the design of the "Tempest Prognosticator," that finding that the Architect had flown to Cotsea Bhaugh on the banks of the Jumna at Delhi, for the idea of the Crystal Palace; I soon pursued him, as "fleet as a glance of the mind," and picked up some of the scattered ornamental fragments he had left behind; to which I added a few Egyptian ones, found on my overland return. I trust the Cotsea Bhaugh splendid corner towers have yet to come, to be placed at the corners of the Crystal Palace. My relics were put together by a few clever Whitby Artisans, and assumed the form of a Lilliputian revolving Temple, which we surrounded and crowned with the germ of the British oak; and is now ready to be placed in the gigantic Building, prepared for the Great Exhibition of the works of Industry of all Nations. And it is to be hoped, that our Whitby pigmy Temples will be distributed all over the world. Mr. President and Gentlemen, you will perceive that I am ambitious. But this is the summit of my ambition;—that my Epitaph may be,—*Here lieth the man, who was instrumental in saving the life of the brave mariner,*

*"Who leaving his dear native shores behind,*
*Trusted his life to the licentious wind."*



In conclusion, I have a few confessions to make, viz. I cannot tell you from what point of the compass a Storm will arise, or when it will come. What I have said in my Vouchers on this last point, was more venturesome than philosophical. With respect to rain, I have not yet arrived at any satisfactory results; but I am still persevering, and shall continue to do so, in the hope that I may, ultimately, discover some new facts. Perseverance is a most essential element in all scientific investigations, I can truly say, that what I could not find out the first year, I discovered the next.

I have drawn six designs of the "Tempest Prognosticator," the principle of which is the same in all, but differently ornamented. No. 1 being the least expensive, to No. 6, which is now in the Crystal Palace, the most expensive, and adapted for any drawing-room. Whatever number may be required, they will all undergo my supervision, and will receive my seal, *after having being tested by me*:—for it is the duty of every Englishman, whatever work he undertakes to do, to do that work well.

If I had had time, I intended to have had another important Experiment for the "Great Exhibition," the application of which was suggested to me by my friend Mr. Henry Barrick, of West Side. It was to be an Apparatus for the use of all future Arctic Voyagers, for the express purpose of supplying them with a perpetual fire, for cooking their food, and for keeping them warm:—to supersede that great difficulty,—the want of fuel in those inclement regions.

As the greatest part of this little Essay has been written by midnight oil, when half Whitby was asleep, I hope for a little politeness from those critics, who are tinctured with the "Essence of Owl," and trust they will spurt as small a quantity of it as possible, at the man, who has devoted the leisure moments allowed him from his professional engagements; and who has made no small effort in endeavouring to accomplish what he trusts may prove a great good.

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